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VA-710/VA-715

5x1 EUROCARD VIDEO SWITCHERS

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**DESIGNED AND MANUFACTURED
IN AUSTRALIA**

VA-710/715

5x1 EUROCARD VIDEO SWITCHERS

INSTRUCTION BOOK

W A R N I N G

OPERATION OF ELECTRONIC EQUIPMENT INVOLVES THE USE OF VOLTAGES AND CURRENTS WHICH MAY BE DANGEROUS TO HUMAN LIFE. OPERATING PERSONNEL SHOULD OBSERVE ALL SAFETY REGULATIONS. DO NOT CHANGE COMPONENTS OR MAKE ADJUSTMENTS INSIDE THE EQUIPMENT WITH POWER **ON** UNLESS PROPER PRECAUTIONS ARE OBSERVED. NOTE THAT UNDER CERTAIN CONDITIONS DANGEROUS POTENTIALS MAY EXIST IN SOME CIRCUITS EVEN THOUGH POWER CONTROLS ARE IN THE **OFF** POSITION.

GENERAL DESCRIPTION

The VA-7.. series and the VA-6.. series are electrically identical. Therefore, for clarity, throughout this description only the VA-7.. naming convention will be used.

The VA-710 and VA-715 are five input video switchers intended for program and monitoring switching in television broadcasting and production studios.

The VA-710 and VA-715 differ only in that the VA-715 comes complete with a CP-600 integral control panel for local control of the switching and that the VA-710 is intended for remote control operation by means of a CP-700 control panel.

The VA-710/715 consist of 5 high input impedance buffer amplifiers with dc-restoration circuits to set sync tip dc level and two switching elements for decreased crosstalk from the input to the common switch bus when an input is not selected. Video switched to the common bus is amplified by the output amplifier which sources two 75 Ohm output circuits.

Control is by a momentary grounding contact from the CP-600 control panel or from a CP-700 remote panel, return tallies are provided on the control lines after the switching function has been initiated.

The switch control circuit encodes the momentary control switch action to 3 bit binary data which is latched and decoded to drive the switch cross-point and the tally driver. A feature of the data latch circuit is the ability to hold data for approximately 5 minutes with the power off and indefinitely if the optional battery is fitted to the front panel.

The switching action is timed to occur in the vertical interval of the video signal present at the output of the switcher by locking the data latch enable pulse to a vertical rate pulse derived from the output video signal.

The control circuit is accessible on the rear of the VA-710/715 video switcher to slave the control circuit of AA-720 audio switchers for audio follow video switching of the accompanying audio signals.

The VA-710/715 is built to the Eurocard format and will mount in a IRT FR-700 frame which provides the 28V CT AC required from the PT-700 dual power supply.

Accessories available are:

CP-600	control panel which plugs onto the front of the VA-710 instead of the normal front panel.
CP-700	remote control panel
AA-720	5x1 Mono Audio Switcher
	Instruction book

TECHNICAL DATA

Video Input Characteristics:	
Input Signal Level	1V p-p composite.
Input Impedance	Four looping bridging One terminating 75 Ohms or bridging on rear connector
Number of Inputs	5
Input Connectors	BNC
Transfer Characteristics:	
Overall Gain	Unity (internal preset)
Frequency Response	±0.1 dB to 10 MHz. ±0.5 dB to 20 MHz.
Differential Gain	not greater than 0.1% at 4.43 MHz
Differential Phase	not greater than 0.1 deg. at 4.43 MHz
Crosstalk	<65 dB to 4.43 MHz. <60 dB to 10 MHz.
Video Output Characteristics:	
Output Signal Level	1V p-p
Number of Outputs	2 DC coupled
Output Impedance	75 Ohms
Output Connectors	BNC
Control:	
Switch action	Grounding contact.
Tally	Ground. (Open collector switch to ground on the control line)
Switching Time	During the vertical interval. Timing is derived from the output video.
Control/Tally Connector	8 pin 0.1 inch spaced socket strip with mating locking plug assembly.
Power:	
Power Requirement:	Dual 28Vac or ±16Vdc.
Power Consumption:	4.6 VA.
Mechanical:	200 mm x 100 mm x 30 mm Eurocard
Configuration:	VA-710 5x1 switcher for remote or follow control VA-715 5x1 switcher for local control

CIRCUIT DESCRIPTION

Video Input and Crosspoint.
The input circuitry consists of five identical input amplifier and crosspoint circuits all connecting to a common signal bus. The video input is AC coupled to Q1 and dc coupled to Q3 and Q4 a complementary pair of emitter followers and then switched onto the common bus by Q5. The input signal is dc-restored to the sync tip level by the clamp diode D3 and feedback action of Q2 which provides the bias for Q1.

The video is switched through the input amplifier and crosspoint circuit when the control signal at base network of Q5 and diode D4 is zero, this forward biases transistors Q3 and Q5 allowing the signal to pass through onto the common switch bus. The switch control line is grounded by the conduction of an open collector transistor in decoder IC U5, which will ground the appropriate control line as determined by the data latched in U3. The control lines not selected will rise in voltage to +9.5 Volts due to the resistor network in the base circuit of Q5 and the diode network to Q3 emitter resulting in Q3 and Q5 base-emitter junctions being reverse biased. The double action of inhibiting the signal from passing through Q3 and isolating Q5 from the common bus ensures low crosstalk from the unused inputs to the common signal bus.

Output Amplifier.
The video output amplifier consists of a differential input amplifier Q26 and Q27 followed by a voltage amplifier Q28 with a collector load consisting of the bias network D16, D17 and R17 of Q29, Q30 and resistor R66. Q29 and Q30 a complementary common emitter pair provides the current gain required for low output impedance. The loop gain of the amplifier is set by feedback from the output via R64 and R63 to the base of Q27 the inverting input of the gain block. Frequency response is adjusted by C20 and RV3 in the feedback path. Adjustment of the DC voltage at the output of the amplifier is achieved by changing the balance of the emitter currents of the input differential transistor pair using RV2. RV1 which forms part of a voltage divider at the input of the amplifier is used to set the overall gain of the video switcher to unity. The output impedance of the amplifier is set at 75 Ohms by resistors R69 and R70 in the output signal path.

Due to small variations in the characteristics of the transistors used in the input amplifiers there will be small DC voltage variations on the signal from each input, in practice these variations will be less than 25 mV and RV2 in the output amplifier is adjusted so that these variations will average out about zero Volts on the output of the amplifier. This is done by switching from input 1 to 5 in sequence with a 1V p-p composite signal present at the inputs and observing the output DC voltage on an oscilloscope, VR2 is then adjusted so that the variation observed averages about ZERO Volts at the blanking level.

Control Circuit.
The control circuit consists of priority encoder U2 and Data latch U3 together with decoder circuits U4 and U5 which drive the switch circuits and tally LED's on the control panel. Data from the encoder U2 is latched in U3 at the rising edge of the pulse generated in U1 , decoded by U5 to drive the crosspoint switch circuits and by U4 to drive the tally circuit.

The tally circuit acts on the input control lines to the switcher thus simplifying the remote control connections, supply voltage for the led indicators on the control panel is provided by D18 from the +12 Volt supply. U5 as well as controlling the crosspoint switches also saturates a PNP transistor which clears the ground from the selected input on U2, thus preparing the encoder for the next switch action.

Link 1 can be used to disable the tally ground on the control line when a number of control circuits are wired in parallel.

Link 2 can be used to remove the led supply voltage to the rear panel to prevent the voltage supplies of parallel connected control circuits interacting. Note this will not remove the LED supply voltage to a CP-600 control panel fitted to the front of a switcher.

Link 3 can be used to force power on reset to input 1, this is normally left out to allow the power off data saving feature of the control circuit to be used.

Latch U2 is a CMOS 4 bit latch which latches data present at the data inputs on the leading edge of the latch pulse applied to the clock input. Transistors Q34 and Q35 serve to initiate the power down action of the latch circuit, isolating the inputs by preventing pin 10 from being grounded and removing the output enable ground on pins 1 and 2. Capacitor C43 will hold the voltage on U3 for about 5 minutes to hold the latched data and a battery can be fitted on the front panel for longer data storage.

An emitter follower stage Q31 with tuned circuit L1, C23 in its emitter circuit to reduce colour subcarrier amplitude and high frequency response of the signal and so improve the noise immunity of the sync separator, buffers the signal from the switcher output amplifier. Q32 the sync separator, saturates when the negative-going sync tips draw base current, producing 12v p-p of sync signal at the collector. The mixed sync is integrated by network R75, C26 and R76, C27 this signal decreasing the base current of Q33 to produce a vertical rate signal at Q33 output. The vertical rate signal at the collector of Q33 attenuated by R78, R79 is used to synchronise astable oscillator U1A.

The latch switch pulse is generated by locking U1A an astable oscillator circuit to the vertical rate from Q33 then delaying the edge of the oscillator output signal in U1B circuit, by approximately 10 lines into the field period of the video signal. The signal is then gated with the any key signal from U2 to provide the clock signal for the latch U3.

Note that if no signal is present at the switcher output to synchronise the astable oscillator, latch pulses will still be generated to allow the switcher to operate, these will occur at the free-running frequency of the astable oscillator.

Power Supplies.
Operating voltages for the VA-710/715 switchers are generated from the PT-700 28 Volt centre tapped AC powered supply supplied with the IRT FR-700 frame. Two bridge rectifier circuits are used to take advantage of the redundant power supply feature of the IRT FR-700 frame. Three terminal regulators U7 and U8 are used to provide the ±12 Volts for the video circuits and a further three terminal regulator U8 is used for the +5 Volt logic circuits.

INSTALLATION

The VA-710/715 video switchers are housed in a IRT FR-700 483 mm (19 inch) rack mounting frame three rack unit (132 mm) high.

All connections are made via the RB-710 rear assembly which plugs onto the rear of the frame and is secured with the 2.5 mm screws provided.

Video input connections for the first four inputs are to pairs of BNC connectors wired for bridging across 75 Ohm circuits, if not used to bridge a video circuit the second connector of the pair must be terminated by a 75 Ohm termination. The fifth input is supplied with one connector and a 75 Ohm terminating resistor R5 provided on the rear panel.

Video output connections are to two BNC connectors.

Control connections to the 5 control lines, ground and the tally led supply are provided by J1. Note that J1 connections are the same as the connections used on the AA-720 audio switcher so simplifying wiring between units. Drawing No. 803074 shows these connections in detail.

LINK 1 is normally set to the **ON** position and only set to the **OFF** position when another switcher is controlled from the same control panel as in RGB switching applications. The second and subsequent switchers are then set with LINK 1 **OFF**.

LINK 2 is set to the **ON** position for a VA-710 operated by a remote panel and in the **OFF** position for a switcher fitted with the CP-600 control panel.

LINK 3 is normally not used, insertion of a shorting link in this position will force power on reset to input 1 and override the power off data saving feature of the VA-710/715.

The backup battery for long term storage of switching status can be fitted to the front panel of a VA-710, the position and polarity are marked on the circuit board. If the switcher is fitted with a CP-600 switch panel there is space there for fitting the resistor diode and battery at the positions indicated on the board as per drawing No. 803071. The battery used is the same as the backup battery used in many PC clock boards and should be available from computer distributors. The backup battery is required only for the master switcher, slave audio or video switchers will not require a battery as they will follow the tally from the master switcher.

MAINTENANCE

The VA-710/715 switchers are factory aligned for correct operation.

Controls are provided for setting the output amplifier DC (RV2), the switcher video gain (RV1), the output amplifier frequency response (C20, RV3) and the clock pulse delay (RV4). Appropriate test equipment must be used to check and adjust these settings if required.

NOTE: If it is necessary to remove a component from the circuit board during maintenance **IT IS ESSENTIAL TO ADD SOME SOLDER TO THE COMPONENT SOLDER JOINTS BEFORE REMOVAL IS ATTEMPTED**. This will add some solder flux to the joint and allow the heat from the iron to flow quickly into the joint and prevent localised overheating and damage to the circuit board.

DRAWING INDEX

Unless otherwise specified all references on diagrams to VA-610 & VA-615 refer equally to the VA-710 & VA-715.

Drawing #	Sheet #	Description
803067	1	VA-710 control circuit schematic.
803067	2	VA-710 signal circuit schematic & power supply.
803067	3	VA-710 component layout main PCB.
803124	4	VA-710 & VA-715 front & rear panel layouts.
803076		RB-610 Rear assembly for VA-610, VA-615, VA-710 & VA-715.
803067D		VA-710 signal circuit schematic & power supply (DC coupled signal path).
803071		CP-600 local 5 x1 control panel schematic.
803740		CP-700 remote control panel schematic.

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